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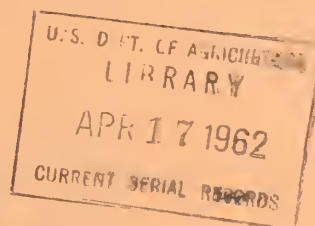
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TECHNICAL EQUIPMENT REPORT NO. 5100-10  
MARCH 10, 1960

# STANDARD SMOKECHASER PACK FRAME AND BAG

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Missoula Equipment Development Center  
Forest Service, U.S. Department of Agriculture

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Editor's Note.--The backpack board, harness, and bag developed as reported herein and covered by U.S. Department of Agriculture-Forest Service Specification No. 5100-55a have been adopted as the new Forest Service standard backpack outfit for smokechasers and helijumpers. Development of improved packs for smokejumpers has not been completed. A servicewide specification (No. 5100-55a) covering the equipment has been issued. This outfit should be available from General Services Administration-Federal Supply Service by late spring 1960.

The smokechaser outfit most commonly used in the western regions for the past 40 years has been made up on the Clack pack frame. This frame consists of flat



strips of hardwood riveted together to form a rectangular base. The load is fastened to the frame with webbing straps. The Clack frame is inexpensive, easy to repair, and not subject to pilfering but is very uncomfortable with loads over 15 pounds.

Smokechasers often need a flashlight, first-aid kit, compass, or a tool while enroute to a fire. Usually, the contents are wrapped in a light canvas manta and tied to the frame. With this arrangement the entire load may have to be disassembled in order to remove one of the items.

Because of the discomfort and inconvenience of the Clack frame, ranger districts throughout the West have substituted various commercial and military pack frames and packsacks. The wide variety now in use indicates that an acceptable standard smoke-chaser outfit is sorely needed.

Probably no piece of equipment used in the Forest Service is more controversial than the pack frame. We found that different mountaineers with the same level of experience had wide differences of opinion regarding the height of loads, harness arrangement, basic shape, and comfort features of pack frames. We investigated Asian, European, and North American back-packing techniques and found that the type and weight of load and conditions under which it is to be carried are the influencing factors in pack frame shape. In defining the requirements for a Forest Service smokechaser's outfit, we selected the following items for consideration:

1. A pack frame must be:
  - a. Lightweight, adjustable, and comfortable with a 35-pound load.
  - b. Adaptable to the loads which might have to be carried in forest fire fighting (tools, pumpers, chain saws, water cans, etc.).
  - c. Convenient, with certain articles readily accessible.
  - d. Commercially available.
  - e. Repairable and easy to maintain.



- f. Versatile so that tools can be carried in a manner to suit the ground cover. Smokechasers in heavy brush country want the handles down so that they can crawl through brush without entangling tool handles overhead, as shown here.



In fallen timber areas, tool handles should be carried up to prevent the load from hanging up while stepping over waist-high fallen logs, like this - - -

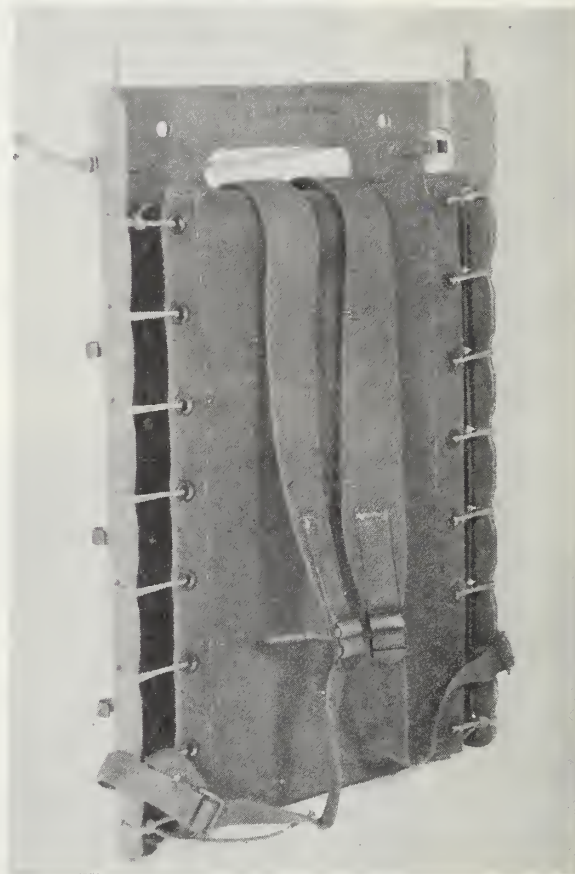


2. A pack bag to be used in combination with frame to provide easy access to items carried. Bag should be large enough to hold a paper sleeping bag, extra rations, and personal gear in addition to the usual smoke-chaser equipment.

We started with the standard Clack frame and padded it to provide a little more comfort, but it was not enough. So we built a fiberglass bow on the lower member that would allow the installation of a lower back strap for added comfort and ventilation.



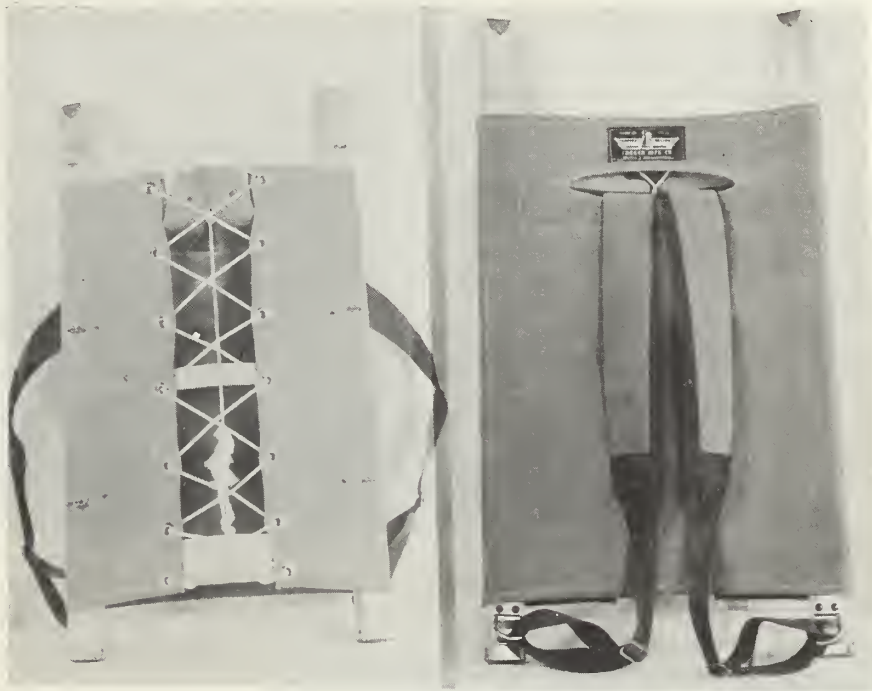
This improved the uncomfortable frame but these modifications reminded us of a \$40 saddle on a \$10 horse.



One of the military pack frames we investigated was of molded plywood. This is an excellent pack frame and has been highly recommended.



Molded plywood pack frames are World War II surplus and cannot be purchased in large numbers commercially. The only known manufacturer, The American Seating Company, informed us that the entire stock had been disposed of and factory facilities dismantled. Retooling to resume production in smaller quantities would make the cost prohibitive. We did not feel that we should base a servicewide standard upon an item which, in a very few years, will be almost impossible to purchase. We investigated several styles which had a hardwood frame enclosed by canvas panels. These included the Trapper Nelson (right) and Yukon frames (left).



This type of frame has excellent comfort features, but it is not well suited for carrying metal items with sharp corners (chain saws, pumpers, fuel cans, and tools). The canvas panel, which is a main part of the harness system, is subject to tear and abrasion damage. The frame is not substantial enough for hard use.

We investigated various  
pack frames made of metal  
tubing and canvas

Among these were--



the military mountain troop rucksack



and

the Himalayan pack frame  
with folding load-support  
shelf

These were, in general, about equal to the canvas and wood frames in performance, but most commercial designs are rather short and wide and do not lend themselves well to the attachment of shovels or sharp-cornered heavy objects.

We designed and tested several pack frames of different shapes and materials.

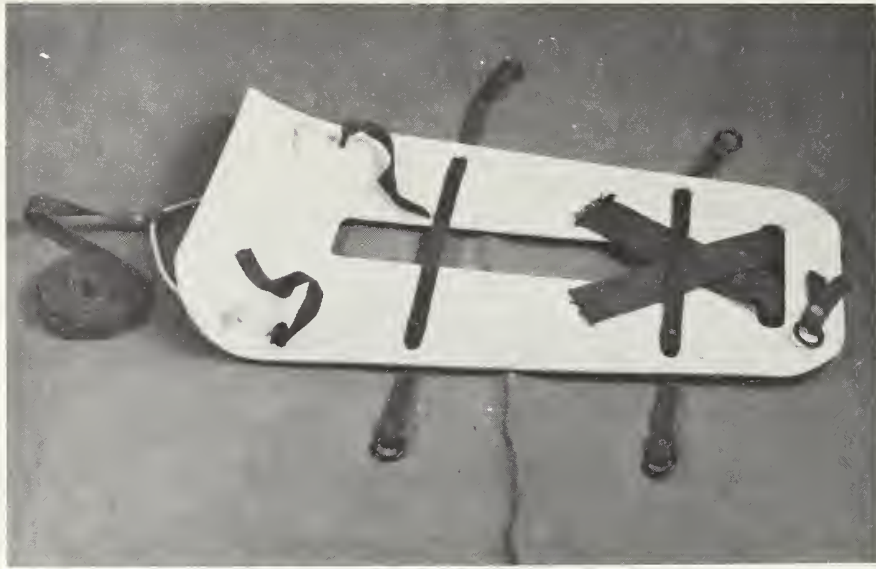


One was made of aluminum alloy with webbing straps and a snap-on pack bag.

This one was a tubular steel frame similar to the Himalayan pack but the rear support shelf was shorter and did not fold.

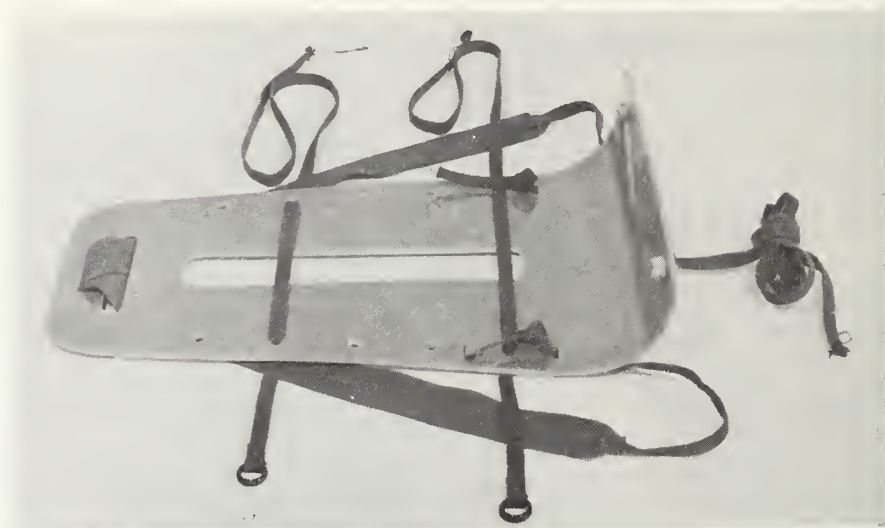


The versatility and strength of plastics offered many design possibilities and we made pack frames of--



polyethylene plastic

and



reinforced polyester -



which were flexible and would fit body contours, but the frame rested on the wearer's back and was uncomfortable on long hot-weather hikes.



From this experience we designed a new pack frame and a sack which have the following features:

1. Molded polyester fiber-glass frame with ventilating space and a bottom support shelf. Bright colored, pigmented resin can be used to increase visibility. This type has a decided advantage since most commercial plastics firms or boat builders can supply these frames in almost any number upon short notice.

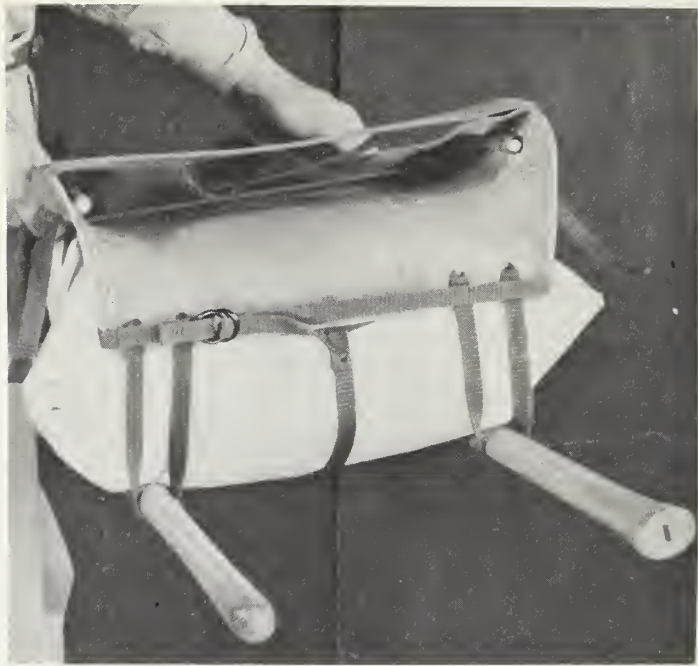


A pack harness with a wide range of adjustability. The shoulder straps render through slots to keep the back strap taut and to provide even pressure and ventilation. The harness is easily removed for repair and replacement.



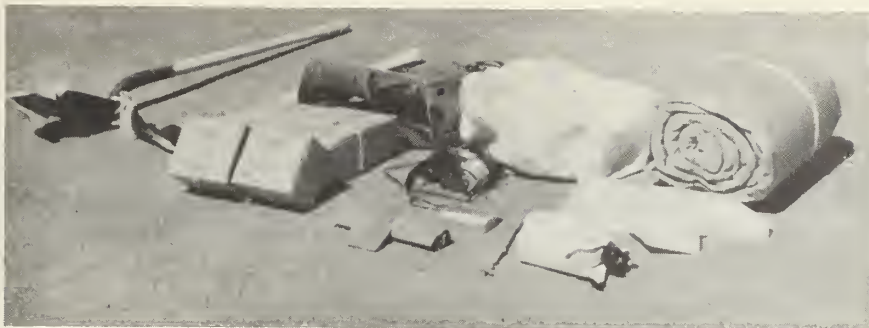
3. A packsack with three accessory pockets and a main bag capacity of 2100 cubic inches. In addition to the usual smokechaser equipment, there is room for a paper sleeping bag, extra rations of water, and personal gear.

4. A tool-fastening arrangement that allows tools to be secured independent of the packsack.



Tools fastened this way  
will remain in proper  
position.





We equipped the pack frame and sack with smokechaser equipment and sent pilot models to the western regions for field testing. Each outfit contained a shovel, pulaski tool, file, two days' field rations, paper sleeping bag, plastic ground cloth, flashlight, first-aid kit, signal mirror, orange paper signal streamers, and 1-quart canteen.

We received varied comments and helpful suggestions, many of which were used in making a final model. All regions agreed that the tool-fastening arrangements were satisfactory, since tools could be carried head up or head down.



Although the molded plastic frame was not designed for smokejumper use, some regions turned the new outfit over to smokejumper units for evaluation. Smokejumpers sometimes carry, drag, and roll their 100-pound loads to get them out to a road head or landing field.



With these loads even the military molded plywood frame is frequently damaged.

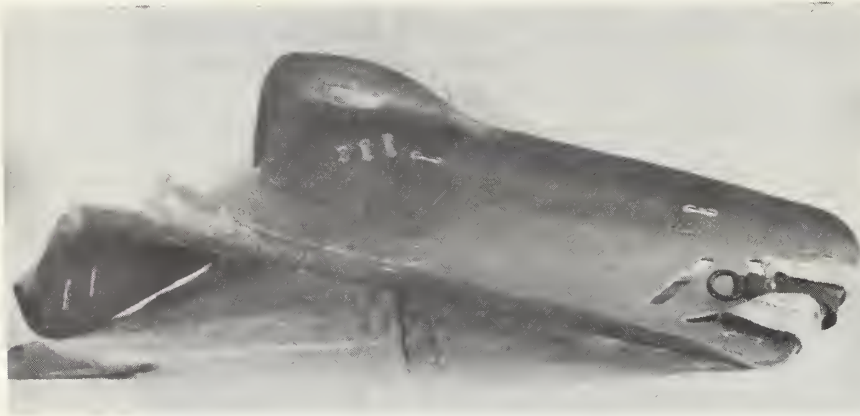
The new pack frame was designed to carry a 35-pound load, and it did not do the job for smokejumpers. For their heavy loads, a wider distribution of weight across the back is needed. We modified the harness to include a self-tightening canvas panel and a



webbing cargo loop and in later tests we carried 75-pound loads for several miles without discomfort.



The field tests showed that we should reinforce the frame at the lower bottom corners to eliminate breakage such as this:



We changed our specification to provide for additional layers of glass cloth at these points

The pack bag was generally well received by the regions. Some wanted to change the location of the pockets and carry the tools on the side of the pack; others wanted tie strings on the bag so that the outfit could be fixed to the frame without the regular pack frame straps. We added tie strings so that -



the bag could be fastened to the frame without straps.



but we did not relocate the accessory pockets because this would interfere with the versatility of tool attachment. Tools carried at the side of a pack, no matter how they are arranged, are too close to the wearer and can injure a man if he turns his face quickly or falls sideways. During one test hike, the oval-shaped pulaski handle turned flatwise to the load causing the tool to extend too close to the face.



The requirements of the western regions were so varied that we could not establish a single standard list of components. Almost all agreed that a 1-man day ration would be sufficient. The majority wanted the paper sleeping bag and plastic ground cloth. We decided that a standard smokechaser outfit with a single list of components would be impractical, so we wrote specifications to allow optional selection of all items suggested by the western regions.

Our field survey showed that the following items are commonly needed in most western areas:

1. Molded fiberglass pack frame complete with harness and tie straps.
2. Canvas bag with tie strings installed to fit the fiberglass frame.
3. One-man ration pack (regular Forest Service field rations.)
4. Pulaski tool.
5. Shovel, zero size.

6. Headlight with batteries.
7. Small first-aid kit.
8. Disposable paper sleeping bag.
9. Plastic ground cover.
10. Signal mirror.
11. Two signal streamers, 7-1/2 feet x 10 inches.
12. Canteen.

Optional items to meet the needs of certain regions included:

1. Fire rake.
2. Firefighter's hand pump and 5-gallon man-pack bag.
3. Two-gallon water bag.
4. Insect repellant.









